What is claimed is:

1. An image processing apparatus, comprising:

    a background judgment device judging whether a target pixel is a background pixel using a standard deviation of gray level of pixels in a vicinity area of the target pixel on receipt of a multilevel image.

2. An image processing apparatus, comprising:

    a background judgment device judging whether a target pixel is a background pixel using a gray level difference and a standard deviation of gray levels of pixels in a vicinity area of the target pixel on receipt of a multilevel image.

3. The apparatus according to claim 2, wherein

    the gray level difference is an amount which is calculated based on a difference between an average gray level of white pixels in the vicinity area of the target pixel and an average gray level of black pixels in the vicinity area of the target pixel.

4. An image processing apparatus, comprising:

    a background judgment device judging for

each target pixel whether the target pixel is a background pixel on receipt of a multilevel image; and

a local binarization device locally binarizing the target pixel, judging which of a background and 5 a stroke the target pixel belongs to, and outputting a binary image if it is judged that the target pixel is not the background pixel.

5. The apparatus according to claim 4, wherein 10 said local binarization device uses an amount which is calculated based on an average and a standard deviation of gray levels of pixels in the vicinity area of the target pixel as a binarization threshold for the target pixel.
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6. The apparatus according to claim 5, wherein the amount which is calculated based on the average and the standard deviation of the gray levels of the pixels in the vicinity area of the target 20 pixel is calculated based on a sum of the average and a constant-multiple of the standard deviation.

7. The apparatus according to claim 5, wherein the vicinity area of the target pixel is 25 a rectangular area of N × N with a prescribed number

of pixels N and the target pixel located at a center.

8. The apparatus according to claim 4, wherein
said background judgment device judges whether
5   the target pixel is the background pixel, using a
standard deviation of gray levels of pixels in the
vicinity area of the target pixel.

9. The apparatus according to claim 8, wherein
10   said background judgment device judges whether
the target pixel is the background pixel under
a background judgment condition of $\sigma < \sigma min$ with σ
as the standard deviation in the vicinity area of
the target pixel and σmin as a prescribed constant.
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10. The apparatus according to claim 4, wherein
said background judgment device judges whether
the target pixel is the background pixel using a
standard deviation of gray levels and a gray level
20   difference of pixels in the vicinity area of the target
pixel.

11. The apparatus according to claim 10, wherein
said background judgment device judges whether
25   the target pixel is the background pixel under

a background judgment condition of $r = \sigma / \Delta g < rmin$ with σ as the standard deviation in the vicinity area of the target pixel, Δg as the gray level difference in the vicinity of the target pixel and rmin as a prescribed

5   constant.

12. The apparatus according to claim 10, wherein
said background judgment device judges whether the target pixel is the background pixel under

10   a background judgment condition of $\Delta g < \Delta gmin$ with Δg as the gray level difference in the vicinity of the target pixel and $\Delta gmin$ as a prescribed constant.

13. The apparatus according to claim 10, wherein

15   the gray level difference is an amount which is calculated based on a difference between an average gray level of white pixels in the vicinity area of the target pixel and an average gray level of black pixels in the vicinity area of the target pixel.

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14. The apparatus according to claim 10, wherein
said background judgment device judges whether the target pixel is a background pixel using a combination of a background judgment conditions $\sigma < \sigma$

25   min, $r = \sigma / \Delta g < rmin$ and $\Delta g < \Delta gmin$ with σ as the

standard deviation in the vicinity area of the target pixel, Δg as the gray level difference in the vicinity of the target pixel and $\sigma\,\text{min}$, rmin and Δgmin as a prescribed constant.

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15. The apparatus according to claim 4, further comprising:

a line element restriction device executing a process of the obtained binary image based on a

10 ratio of black pixels in a shape-fixed line element mask including the target pixel and outputting a binary image.

16. The apparatus according to claim 15, wherein

15 said line element restriction device leaves the black pixels in the line element mask as black pixels if the ratio of black pixels in the line element mask is a prescribed ratio or more.

20 17. The apparatus according to claim 15, wherein said line element restriction device converts all pixels in the line element mask into black pixels if the ratio of black pixels in the line element mask is a prescribed ratio or more.

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18. The apparatus according to claim 15, wherein

said line element restriction device converts all pixels in the line element mask into white pixels if the ratio of black pixels in the line element mask

5   is less than a prescribed ratio.

19. The apparatus according to claim 15, wherein

said line element restriction device uses a plurality of line element masks.

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20. The apparatus according to claim 4, further comprising:

a stroke separation device applying a partial pattern in a gray scale image corresponding to

15   a black pixel joint element in the obtained binary image and separating strokes of different gray levels.

21. The apparatus according to claim 20, wherein

said stroke separation device judges whether

20   to perform a stroke separation using one of an inter-class dispersion and a dispersion ratio between different strokes.

22. The apparatus according to claim 4, wherein

25   said local binarization device judges which

of the background and the stroke a pixel, which is judged to be the background pixel by said background judgment device, belongs to based on a gray level of the pixel.

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23. An image processing method, comprising:

judging for each target pixel whether a target pixel is a background pixel on receipt of a multilevel image; and

10   locally binarizing the target pixel, judging which of a background and a stroke the target pixel belongs to and outputting a binary image if it is judged that the target pixel is not the background pixel.

15 24.   The   method   according   to   claim   23, further comprising:

processing the obtained binary image based on a ratio of black pixels in a shape-fixed line element mask including the target pixel; and

20   outputting a binary image.

25.   The   method   according   to   claim   23, further comprising:

binarizing a partial pattern in a gray scale

25 image corresponding to a black pixel joint element in

the obtained binary image; and

    separating strokes of different gray levels.

26. A computer-readable storage medium on which

5 is recorded a program for enabling a computer extracting a stroke included in an inputted multilevel image to perform a process, said process comprising:

    judging for each target pixel whether a target pixel is a background pixel on receipt of a

10 multilevel image; and

    locally binarizing the target pixel, judging which of a background and a stroke the target pixel belongs to and outputting a binary image if it is judged that the target pixel is not the background pixel.

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27. The storage medium according to claim 26, said process further comprising:

    processing the obtained binary image based on a ratio of black pixels in a shape-fixed line

20 element mask including the target pixel; and

    outputting a binary image.

28. The storage medium according to claim 26, said process further comprising:

25   binarizing a partial pattern in a gray scale

image corresponding to a black pixel joint element in the obtained binary image; and

separating strokes of different gray levels.

5   29. An image processing apparatus, comprising:

input means for receiving a multilevel image; and

background judgment means for judging whether a target pixel is a background pixel using a standard deviation of gray levels of pixels in a

10   vicinity area of the target pixel.

30. An image processing apparatus, comprising:

input means for receiving a multilevel image; and

background judgment means for judging whether

15   a target pixel is a background pixel using a gray level difference and a standard deviation of gray levels of pixels in a vicinity area of the target pixel.

31. An image processing apparatus, comprising:

20   background judgment means for judging for each target pixel whether the target pixel is a background pixel on receipt of a multilevel image; and

local binarization means for locally binarizing the target pixel, judging which of a

25   background and a stroke the target pixel belongs to,

and outputting a binary image if it is judged that the target pixel is not the background pixel.

32. A transmission signal transmitting to a computer, which extracts a stroke included in an inputted multilevel image, a program for enabling the computer to perform a process, said process comprising:

judging for each target pixel whether a target pixel is a background pixel on receipt of a multilevel image; and

locally binarizing the target pixel, judging which of a background and a stroke the target pixel belongs to and outputting a binary image if it is judged that the target pixel is not the background pixel.